Course Outcomes:
1. To grasp key concepts, types of research, and the research process, including problem definition, literature review, and hypothesis formulation.
2. To develop effective research designs, understand hypothesis testing, and apply sampling techniques and experimental designs.
3. To efficiently search literature, write structured research reports, and differentiate between research papers and reports.
4. To master data analysis techniques, hypothesis testing, and use tools like MS Excel for statistical calculations.
5. To understand the research publication process, journal selection, and use of databases like Scopus and Science Citation Index.
6. To recognize ethical practices, avoid plagiarism, and ensure compliance in research and publication processes

UNIT I-Introduction to Research Methodology

Meaning of research, Objectives of research, Motivation and purpose, Types of research, steps in research (Define Research Problems, Literature Review, Formulating Hypothesis, Research Designs, Data Collection, Data Analysis & Hypothesis Testing Interpretation & Reporting), Criteria of good research, Problems encountered by researchers in India, Ethics & Misconduct in Research-Plagiarism (Direct, Mosaic, Self and Accidental)

Research Problem- Selection & Strategy, Research Design - Sampling design, observational design, statistical design & operational design; Basic principles of experimental designs (principles of replication, randomization, local control); Research Plan- Definition & components,Hypothesis Formulation (Characteristics, Null vs Alternative hypothesis, Level of significance, Confidence level, p-value, steps in hypothesis testing), Sampling Techniques – Probability sampling vs Non-probability sampling, Sampling error, sample size estimation, Types of Experimental Designs and controls, Measurement Scales & Significance.

UNIT II- Literature Survey & Data Collection

Literature types- compendia and tables of information, Articles – Thesis – Journals – Patents – General treatises – Monographs- Literature search and Review of literature, Report writing – target audience – types of reports – contents of reports – Introduction (Literature Review, Citation & Referencing), Procedure (Language Style, Figures and Diagrams), Results (Graphs & Tables), Discussion & Conclusion (Style), Abstract, Front Matter, Appendices, General Guidelines, Research Papers vs Research Reports/Thesis.

Unit-III: Data Analysis

Data types, Shape of the data (Frequency Distribution-Histogram), Central Tendency of data (Mean, Median & Mode), Measures of Positions (Quartiles, Deciles & Percentiles) and Dispersion of data (Absolute and Relative Measures), their method of computation, characteristics and applications, Outlier estimation (mild & extreme), Box and Whisker plot.

Hypothesis Testing – Null and Alternate Hypothesis, Normal Distribution and characteristics, Point and Interval Estimation, Hypothesis testing using Z, F and t-distributions (single and two-tailed) using table Values and their applications, ANOVA – computational method and application, Covariance and Correlation and Regression – Importance, computation and Suitability. Estimation of Histogram, descriptive statistics, correlation and regression using MS Excel.

Unit-IV: Resources & Publication

Methods of data collection – Primary and secondary data – observation – interview – Questionnaire-schedule methods –Collection of secondary data- criteria and sources, Case-study Method – phases, assumptions, advantages & disadvantages.
Journal writing- Research and Publication Cycles, Publication process, Journal Selection Criteria. Basic information about Science Direct and Open Access Journals, Journal Impact Factor, Database search –Scopus – Science citation index.

Unit-V: Research and Publication Ethics
Introduction to Ethics, Misconduct in Research and Publication, Plagiarism & Copyright, Database and Citation Indexing, Research Metrics. Mini-Projects.

RESEARCH & PUBLICATION ETHICS (Sub. Code: 22RPE12)

(Compulsory for all Ph.D. scholars admitted after March 2022)

Course Outcomes:

1. To appreciate and imbibe the philosophy of science and ethics, research integrity and publication ethics.
2. To recognize and avoid research misconduct and publications in predatory journals.

3. To utilize the various indexing and citation databases, open access publications
4. To understand various research metrics (citations, h-index, impact Factor, etc.) and use them in proper selection of journals.
5. To develop proficiency in dealing with plagiarism tools as well as online resource tools for publisher verification and journal selection

Unit-I

A: Philosophy and Ethics

Introduction to Philosophy: definition, nature, scope, concept, branches Ethics: definition, moral philosophy, nature of moral judgment and reactions

B-Scientific Conduct

Ethics with respect to science and research Intellectual honesty and research integrity, copyright- Scientific misconduct: falsification, fabrication and Plagiarism (FFP) Redundant Publication: duplication and overlapping publication n salami slicing Selective reporting and misrepresentation of data.

Unit-II

A- Publication Ethics: Definition, introduction and importance- best practices/standard setting initiative and guidelines: COPE, WAME, etc. Conflict and interest

B- Publication Misconduct: Definition, concept, problems that leads to unethical behaviour and vice versa, type- Violation of publication ethics, authorship and contributorship Identification of publication misconduct, complaint and appeals Predatory publisher and journals, Avoiding Plagiarism. Preparing documents for MoUs, Confidentiality Agreements

Unit-III

Open access publishing- Open access publication and initiatives- SHERPA/RoMEOonline resource to check publisher copyright and self- archiving policies Software tool to identify predatory publication developed by SPPU Journal finder/journal suggestion tools viz. JANE, Elsevier Journal finder, Springer, Journal Suggester, etc.

Group Discussion: Subject Specific Ethical Issues FFP, authorship Conflict interest, Complaints and appeals: examples and fraud from India and abroad

Unit-IV

Publication Misconduct- Group Discussion- Subject Specific Ethical Issues, FFP, authorship Conflict interest, Complaints and appeals: examples and fraud from India and abroad

Group: Software tools- Use of plagiarism software like Turnitin, Urkund and other open-source software tools

Unit-V

Database- Indexing database- Citation database: Web of Science, Scopus, etc.- Research metrics- Impact factor of Journal as per journal citation report, SNIP,SJR,IPP, Cite Score Metrics: h-index, g-index, i-10 index, altmetrics